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AUTHOR Roberts, Wesley K.
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ABSTRACT

The initial four phases of the Training Extension Course (TEC), a project to remedy deficiencies in training programs for armed forces recruits, employed systematic instructional development and extensive audiovisual resources. The project required subcontracting for lesson production and modifications in personnel and budgeting. Posttest evidence indicated that the curriculum prepared soldiers to perform actual criterion tasks. Plans have been laid to expand the program in the future. (EMH)

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A MANHATTAN PROJECT IN EDUCATIONAL TECHNOLOGY, PART II

WESLEY K. ROBERTS
US ARMY COMBAT ARMS TRAINING BOARD
FORT BENNING, GEORGIA 31905

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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TEC: A Manhattan Project in Educational Technology, Part II

WESLEY K. ROBERTS

US Army Combat Arms Training Board

In any field of study, significant achievements are constantly emerging, yet their impact is often sporadic. More than one technology has considerably improved human effectiveness as the result of a singular substantial effort. However, few communities, organizations, or institutions have the wherewithal to initiate large scale projects having immediate and long term impact on a technology; apply state-of-the-art techniques; aggregate the efforts of a variety of interests, agencies and organizations; or have access to a wide representation of project output recipients to validate the usefulness of the product before it is implemented for use by others.

The US Army has historically been a catalyst for rapid advancement of a technology for the purpose of meeting both immediate and long range objectives. One of these catalyst programs was known as the "Manhattan Project". Anyone familiar with the outcomes of that effort knows of the

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A special note of thanks goes to Charleen Massey for many hours of assistance on this paper.

devastating results that atomic warheads had, both immediately and permanently. Nonetheless, the Manhattan Project achieved considerable advancement for nuclear technology, much to the despondency of its opponents and to the gratification of its proponents.

In August 1971, the Army began another project, not so bold as the one begun during World War II, yet one that has served as a catalyst to rapidly advance the field of educational technology, even to the degree of being coined as a "Manhattan Project in Educational Technology" (Roberts, Lawson, and Neal, 1976). This project is called the Training Extension Course, or more popularly, by its acronym, TEC.

The Evolution of TEC

The TEC project began as a result of a study directed by the US Army Chief of Staff, aimed at identifying problems leading to ineffective soldiering, and to offer some possible courses of action for solution. The group tasked to complete this study became known as the Board for Dynamic Training. It was formed at Fort Benning, Georgia in 1971 and was terminated during the early months of 1972 as its functional successor, the US Army Combat Arms Training Board, was constituted.

The Board for Dynamic Training began its mission using both a system and systems analysis (cf. Kaufman, 1972). A system analysis identified Army-wide problems. Once isolated into generic categories, a systems approach was employed to isolate needs.

Identified needs included a requirement to improve training Army-wide (including Reserve Component units) from the standpoint of both technical and tactical proficiency (cit. Report of the Board for Dynamic Training, 1971).

Applying both logic and a great deal of cost-effectiveness insight to the identified gap between what training was being provided and what was desired resulted in a course of action to provide prepackaged, self-instructional training to soldiers, wherever they happen to be, but primarily to those in tactical units.

Ergo, the beginning of a project that would possibly serve as the catalyst that would liken the rapid advancement of educational technology to that of nuclear technology growth ensuing from the Manhattan Project of World War II.

An Overview of the First Four Phases of TEC

The TEC project was initially directed at resolving training deficiencies found in Army units for soldiers

serving in the Air Defense Artillery, Armor, Field Artillery, and Infantry branches. In order to isolate tasks that require training in the job environment (i.e. initial, refresher or continuation training), a research project was initiated. The results of this study, conducted by the Army and by the Human Resources Research Organization (HumRRO), served as the basis for identifying tasks for training in the early phases of the TEC project.

TEC I

Concurrent with the joint Army-HumRRO study, the U.S. Army Infantry School began a pilot test of the TEC concept. Due to the average readability level of soldiers, this test used a synchronized sound/slide format (35 mm slide and standard audio cassette). Fifty-six lessons, applicable to Infantry noncommissioned officers, were developed by Infantry School instructors and Infantry Officer Advance Course students. These materials were tested in ten Infantry battalions, representing both active army and reserve component units.

The timing of this pilot test did not allow for a scientific derivation of tasks for which training would be required. Rather, subject matter was selected from

existing documents which had not been validated against actual job performance requirements.

Jacobs and Hardy (1974) investigated the effects of this pilot test of the TEC concept. Two significant findings which led to a continuation of the TEC project included;

- The use of TEC I training materials proved effective in reducing the effect of verbal English ability on Military Occupational Specialty test performance.
- Soldiers in units that required the use of TEC I training materials in study preparation for the Military Occupational Specialty test scored higher on the test than soldiers in units where TEC I training materials were not used.

Other feedback on the TEC I project included a favorable attitude from unit leaders in regard to TEC as well as positive responses from TEC I lesson users.

A significant finding impacting on the future of the TEC project was the storage requirements for the synchronized sound/slide lessons. Units simply did not have the capability to stockpile and store volumes of lessons in their present format: this finding led to new medium alternatives in the next phases of the TEC project.

TEC II

The results of the pilot test or TEC I had considerable influence on the next phase of the TEC project - TEC II. Many of the lessons learned from TEC I were instrumental in the design of the new methods TEC II employed in providing instruction for soldiers in Air Defense Artillery, Armor, Field Artillery and Infantry units.

Among the new methods incorporated into the TEC II program were:

- Super 8mm film cartridges with synchronized audio cassette tapes replaced the 35mm slide/sound format.
- Lessons were based on the findings of a job/task analysis of Military Occupational Specialties for which instruction was to be developed.
- All lessons were subjected to at least one developmental trial and a validation test, using members of the intended TEC lesson users as subjects.
- A lesson development model was used to insure the application of educational technology to the TEC II project.

The lesson development model adopted for TEC II is known as CISTRAIN, the acronym for Coordinated Instructional Systems Training. It was selected to advise government and government contractor personnel on the educational technology methods desired for application in the TEC program.

Also, the model was to insure a minimum quality of lessons early in the program and reduce the variability in the design of lessons that could have resulted from a less controlled approach. The CISTRAIN model is an empirical model of lesson development which relies heavily on tryout and revision cycles during lesson preparation and developmental testing as opposed to an analytical or artistic model which has been proposed by other instructional developers (cf. Bunderson and Faust, 1976).

Lessons developed in TEC II were a joint effort between US Army service schools (the US Army Air Defense School, the US Army Armor School, the US Army Field Artillery School, and the US Army Infantry School), two government contractors for lesson development (American Analysis, Inc., and Insgroup, Inc.), and one for audiovisual and audio lesson reproduction (Stockdale, Inc.).

Success in TEC II was witnessed in many ways, to include: verbal reports of supervisors noting improved overall professional and technical performance of Army service school personnel working on the TEC II project; positive reports from units where TEC II lessons were being put through development tests and validation trials; an

improved communication between Army service schools which assisted in reducing redundancy in lesson preparation; increased reliability in Service School products expressed by unit using TEC II lessons; and a significant effect on the developmental testing and validation procedures for all instruction being produced in the schools participating in TEC II.

These successes, along with an on-going needs assessment isolating additional support requirements for Army units, influenced the expansion of TEC while the TEC II phase was still gaining momentum.

TEC III

Following the introduction of TEC I and II, a survey administered in a representative sample of Army Combat Arms[1] unit commanders evidenced a need for training support in five high skill level jobs found in small numbers in every unit. A subsequent job analysis ascertained the specific and most important tasks for training assistance through what became known as the TEC III program.

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[1] At that time there were four Army branches referred to as Combat Arms. They were: Air Defense Artillery, Armor, Field Artillery, and the Infantry. Late in 1975, Corps of Engineers was added as a Combat Arms Branch.

This expansion of TEC, TEC III, brought five[2] more Army service schools into the educational technology project which would be the catalyst for a significant change in how soldiers receive their training.

While TEC I lessons had all been produced in a 35 mm slide/syncronized sound format, TEC II expanded media use to three new formats. They were, a super 8 mm film cartridge/audio cassette, an audio cassette format, and the use of job aids. In TEC III, a fourth lesson format, printed text, was introduced.

The media selection process in TEC I, II, and III was generally based on expected life of the lesson content and availability of tools and equipment for skill acquisition and practice. When possible, the audiovisual format was used in an effort to reduce the effects of low verbal ability on task mastery in other media as substantiated in earlier findings (Jacobs, T. O., and Hardy, R. A. Jr., 1974).

TEC IV

Initial distribution of TEC II lessons was made during June 1974. The growing popularity and established usefulness of TEC lessons caused commanders of combat service and combat service support units to request TEC lessons to

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[2] Schools added under TEC III included; the US Army Engineer School, the US Army Institute of Administration, the US Army Ordnance Center and School, the US Army Quartermaster School, and the US Army Signal School.

support training of their soldiers. Nine[3] additional Army service schools were brought into the TEC program under the aegis of TEC IV. This increased the number of Army service schools in the TEC program to eighteen.

During the initial stages of the TEC IV program, it was becoming evident that the Army service schools and contract monitoring agencies were internally benefiting from their efforts in the form of a sharply rising professional competence in educational technology. The workshops, seminars, conferences, and daily job tasks required in this project were beginning to pay off in somewhat predictable forms.

The reliance on a particular medium, in this case, audiovisual, was becoming less noticeable. Feedback from other media forms increased the confidence of the Army service schools to take a learning approach in TEC media selection, as well as that of lesson content, life expectancy, and tool and equipment availability.

During the TEC IV Program the Army began to be more discriminant in selecting tasks for training through the TEC Program (US Army TRADOC Letter, 1975).

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[3] New schools added under TEC IV included: the Academy of Health Sciences, the US Army Security Agency Training Center and School, the US Army Aviation School, the US Army Chaplain School, the US Army Intelligence Center and School, the US Army Judge Advocate General School, The US Army Missile and Munitions School, the US Army Military Police School, and the US Army Transportation School.

The contractual support for TEC IV progressed in two phases. With minor modifications, the first phase used the basic TEC contracting model (sequence of government and contractor actions) and procedures used in TEC II and III. During the first procurement of TEC IV lessons, a new lesson development contractor was added (Teaching Systems, Inc.). However, during the second procurement of TEC IV lessons, a significant change took place in the contracting module and procedures. Some of the major changes included:

- One contractor (both development and reproduction) is used for the entire procurement rather than requesting a separate bid for each school.
- The contractor makes an evaluation of government furnished materials (GFM), and recommends and makes changes under a separately priced component rather than a research and analysis component.
- Component pricing is in effect only until the government has approved a lesson's objectives, tests, content, design approach; and first draft script; fixed pricing then takes over.
- The requirement for use of the CISTRAIN Model was deleted.

Justification for using one contractor for the second phase of TEC IV, which includes the projected development of over 300 lessons, was based on decisions regarding the

management of the overall effort and the probability of reduced over-all costs in the program. Thereby, the government was applying cost-effectiveness techniques to the TEC program via the contractual apparatus.

Throughout the TEC program there has been repeated discrepancies in the quality of GFM, causing revisions of various quantity and quality to be made by both the government and the contractor. Because there was no standard rate or specific component in the contract addressing this type of evaluation or revision, it was decided to include an event in the contract calling for an evaluation and revision of GFM.

Largely due to experience gained in TEC II and recommendations made by analysts,[4] the contract was modified from a total component price to a mixture of component and fixed pricing. This technique was implemented to reduce the overall costs involved in the development of TEC lessons.

Throughout the TEC program up to and including the initial procurement for TEC IV, the CISTRAIN model had been specified in the contract statement of work as the method to be used in designing and developing TEC lessons. A decision was made in the second phase of TEC IV procurement to elimi-

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[4]These analysts included personnel contracted through the Scientific Services Program of Battelle Memorial Laboratories, and government contract experts, both military and civilian.

nate this requirement. Use of CISTRAIN became optional, as did any other lesson development model proposed by the successful contractor and subsequently approved by the government.

Influencing this decision was the increased sophistication in the field of educational technology on the part of government personnel working in the TEC program. Possibly more important was the fact that component educational technology contractors already have established lesson development procedures within their organizations. Their personnel are familiar with these procedures, use them in their functions of instructional design and development, and as long as their model met the criteria established for TEC lesson development, (i.e. performance objectives, criterion and performance tests, relevant materials only, developmental testing and revision, etc.), it was not necessary to prescribe or endorse a particular lesson development model.

PROFESSIONAL SUPPORT USED IN TEC

Beginning with TEC's impetus, the Army has used a professional staff of analysts[5] to provide continuous evaluation,

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[5]These analysts have included: Allan J. Abedor, Lawrence T. Alexander, Theodore H. Blau, Frank W. Banghart, Walter R. Borg, Donald J. Cunningham, Stephen W. Daeschner, Robert H. Davis, William Deterline, Philip L. Doughty, Nancy L. Gulli-

state-of-the art updating, and to incorporate corrective measures when shortcomings have been identified. These personnel have been provided through a contract between the Army Research Office, Durham, North Carolina, and the Battelle Memorial Laboratories. This particular type of support has been invaluable to the growth and efficacy of the TEC program.

Selected Data on TEC Lessons to Date

As of April 4, 1976, there have been 471 TEC lessons validated. This means that they have been revised twice at a minimum and have either been fielded or are in the final stages of production. In Table 1 are scores from pre- and posttests given during large-group validations of these lessons.

ARMY SCHOOL	TOTAL NUMBER OF SUBJECTS USED	AVERAGE PRETEST SCORES BY % OF CORRECT RESPONSES	AVERAGE POSTTEST SCORES BY % OF CORRECT RESPONSES	TOTAL NUMBER OF LESSONS VALIDATED	AVERAGE NUMBER OF SUBJECTS PER VALIDATION TRIAL
Air Defense	2663	38.89	92.98	108	25 **
Armor	1541	45.03	90.17	84	18
Engineer	214	41.24	90.51	9	24
Field Artillery	2805	41.48	88.18	111	25
Infantry	2386	36.57	87.98	90	27
Institute of Administration	264	50.53	92.44	7	38
Ordnance	550	25.67	83.50	22	25
Quartermaster	603	23.55	94.87	22	27
Signal	167	0.00*	98.18	18	9***
TOTAL	11,193	38.63	89.98	471	24

* No pretest used due to zero entry level of subjects.
** Rounded to nearest whole number.
*** The Signal School uses less subjects in their validation trials as they use a Sequential Sampling Technique (Edstein, 1975).

TABLE 1. Validation Data on Trials Reported for TEC Lessons as of April 4, 1976

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[5](Cont'd ford, Margo Hicks, Richard M. Jaeger, Roger A. Kaufman, Edward F. Kelley,, Raymond W. Kulhavy, Sidney S. Micek, Gail T. Rayner, Leonard Reiffel, Charles F. Schuller, David R. Stone, Ken B. Smith, Sanford Temkin, Donald T.

Methods for improving the techniques used in the developmental and validation trials are constantly being sought. Evidence of this is found in the Signal School's adaptation of a sequential sampling technique (Epstein, 1975) which has a high confidence level and significantly reduces the number of subjects required in this phase of lesson development.[6]

Media Used in TEC

Referred to earlier in this paper was the multimedia nature of TEC. In Table 2 is a synopsis of the media used in TEC lessons to date.

Status of Lesson	Media				
	Job Aid	Audiovisual	Audio	Printed Text	TOTAL
Fielded	1	113	12	4	130
Ready for Distribution	0	67	10	4	81
Under Mass Reproduction	0	59	2	0	61
Answer Print Stage	0	119	2	2	123
35 mm Sound/Slide or Draft Stage	0	89	1	3	93
TOTAL	1	447	27	13	488

TABLE 2. Summary of Lesson Status and Media Used in TEC Lessons as of March 29, 1976.

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[5](Cont'd) Tosti, Paul A. Twelker, Larry J. Walter, Walter A. Wittich and the Center for Educational Technology, Florida State University (through a separate contract).

[6]The normal procedure for the large group validation trials is to use an N of 30.

Numbers of Lessons in TEC

Persons encountering literature on the TEC program for the first time are sometimes deceived into thinking it is just another "short range" project for a specific subject area. For those who may fit into this category, Table 3 displays lesson status (completed & programmed) as of April 1, 1976.

Status of Lessons	Number of Lessons
Lessons completed*	488
Lessons in production	422
Lessons currently being procured	319 **
Lessons under consideration for future procurement (FY77)	630***
TOTAL	1,859

*Lessons developed up to the developmental testing stage.
**Projected for Phase II of the TEC IV procurement.
***Planning figures only.

TABLE 3. Summary of the status and number of TEC Lessons as of April 1, 1976

The recent acceleration in the number of TEC lessons ready for distribution or fielded is not discernible using Table 3. In order to emphasize the rapid growth of TEC

lessons available to soldiers in units another visualization is helpful. Table 4 depicts this expansion.

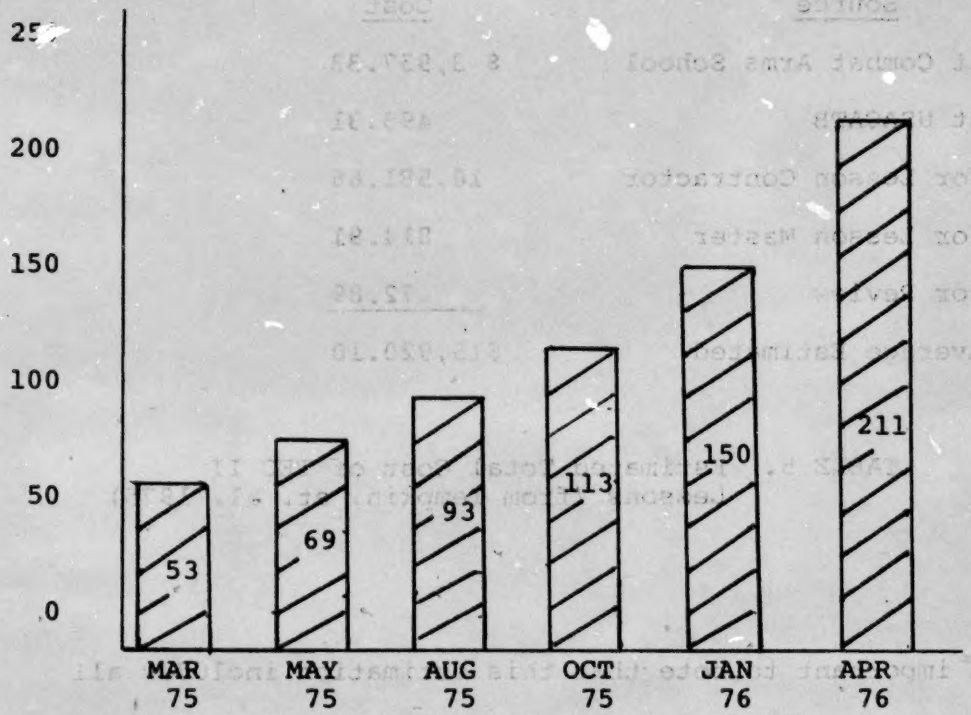

TABLE 4. Number of TEC Lessons ready for distribution or fielded at selected intervals 1975-76.

Cost Data

Very often there are questions concerning the cost of TEC lessons. Tempkin, et. al. (1975), conducted a cost assessment of Army training alternatives to include TEC.

Their data concerning the estimated cost of TEC lessons in the TEC II program only are shown in Table 5.

Source	Cost
at Combat Arms School	$ 3,957.33
at USACATB	493.31
for Lesson Contractor	10,581.66
for Lesson Master	814.91
for Review	72.89
Average Estimated	$15,920.10

TABLE 5. Estimated Total Cost of TEC II Lessons (from Tempkin, et. al. 1975)

It is important to note that this estimation includes all identifiable costs. The cost for the lesson development only by a government contractor has ranged from a low of $4,800.00 to a high of $27,000.00. Due to the partial billing techniques used in this procurement, more definitive cost data are not presently available. Also, it should be pointed out here that each TEC lesson represents a

different size bite out of the Army's training needs, and therefore, costs will vary significantly from lesson to lesson when a component priced contract is used. Phase II of the TEC IV procurement is attempting to somewhat standardize lesson costs by using a mixture of component and fixed pricing.

TEC'S TRAINING EFFECTIVENESS

As can be substantiated by the scores achieved during validation trials on posttests administered after one exposure to the TEC lesson, as evidenced in Table 1., TEC lessons adequately prepare the target audience for mastery of their objectives. Keeping these posttest scores in mind, a word of caution should be noted here. Caution should be taken in generalizing the instructional effect on pre to posttest achievement when these are identical measures. Tobias and Ingber (1976) found the correlation between these variables to be .84 in a similar study on achievement - treatment interaction. King (1973) stated earlier in TEC program evaluation that when knowledge test items are used for testing purposes, the relationship between a soldier's scores and actual field performance of the criterion task by the same soldier is unknown. Since many of the earlier TEC

lessons used knowledge tests, King's observation applies. Albeit, the intent of the program is to have performance tests for all TEC lessons, this desired characteristic has yet to be fully achieved.

A study which measured actual criterion task performance of soldiers taking selected TEC lessons compared against soldiers receiving conventional instruction was completed by Knerr, Downey, and Kessler, (1975). The results of the research indicated that TEC-trained groups in general scored highest on the performance tests. TEC lessons consistently improved soldiers' performance, regardless of their level of mental ability. This finding suggests that TEC lessons would be particularly useful for training of mixed-aptitude personnel. Further findings indicated, however, that where skill or practice with equipment is involved in the training for criterion task performance, conventional instruction is equally effective.

Lessons under development in phase II of the TEC IV procurement will have performance tests administered as part of the contractual development process. This new addition to TEC lesson development adds a new dimension of evaluation - one which promises data to substantiate and validate actual criterion task performance as a function of TEC lesson

instruction. In summary, TEC lessons are validating as an instructional technique for facilitating mastery of their objectives. There is evidence to confirm that they prepare soldiers to perform the actual criterion task even when knowledge posttesting techniques are used. Future TEC lesson development will take into account actual criterion task performance as a result of TEC instruction during the contractual development process.

TEC EXPANSION IN FY 77

Currently, plans are being made to expand the TEC program to include one and possibly two new schools[7] in fiscal year 1977. This broadening of the program is projected to result in some 630 new TEC lessons for Army Training. These lessons will have a mixture of proponency in the new schools and with Army schools already in TEC.

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[7]The Defense Information School and possibly the Defense Language Institute.

FUTURE OF THE PROGRAM

A look into the out-years foresees the TEC program to continue to grow as a major training resource with the Army. With this growth there should be expected resistance which can be accounted for by the pendulum theory of social change. This theory asserts, in part, that ensuing a period of change, there will be a period of reaction equal in magnitude to the magnitude of change (cf. Anderson and Faust, 1974, p. 17). In the immediate future, TEC is envisioned as a program continuing in much the same media as it has to date. The number of lessons being produced should begin to level off during 1978.

Looking farther into the 1980's, the TEC plan is for a highly interactive wired-garrison training program which includes all types of training, to include both on- and off-line instruction (i.e. CAI, TEC, on-the-job training, correspondence courses). Computerized management of each soldier's training will allow for both immediate corrective feedback on and advance placement into training modules.

The hardware systems used in TEC during this period will be selected based on the research and development that takes place during the next few years. Software development will continue to use state-of-the-art educational technology applications.

EPILOGUE

In an earlier paper on TEC (Roberts, Lawson, and Neal, 1976), reference was made to the call for a Manhattan Project in Educational Technology made by Deterline (1970) to Gagné during an interview on the future of educational research. This call has been met by the Army through the TEC program. The use of systematic design and development approaches, employing developmental tryouts of instructional materials, has proven effective in the TEC program. Once again, the US Army has brought its expansive resources together in an effort to reduce a problem confronting the defense. This time the problem was not how to develop a weapon to end a World War. It was, how to best train our soldiers to be prepared for the next war. As was the case with the Manhattan Project of the 1940's, there will be side effects, both short and long range, from the TEC project. These effects should be mostly positive, ones that allow for the improvement of human performance through the application of educational technology to instruction.

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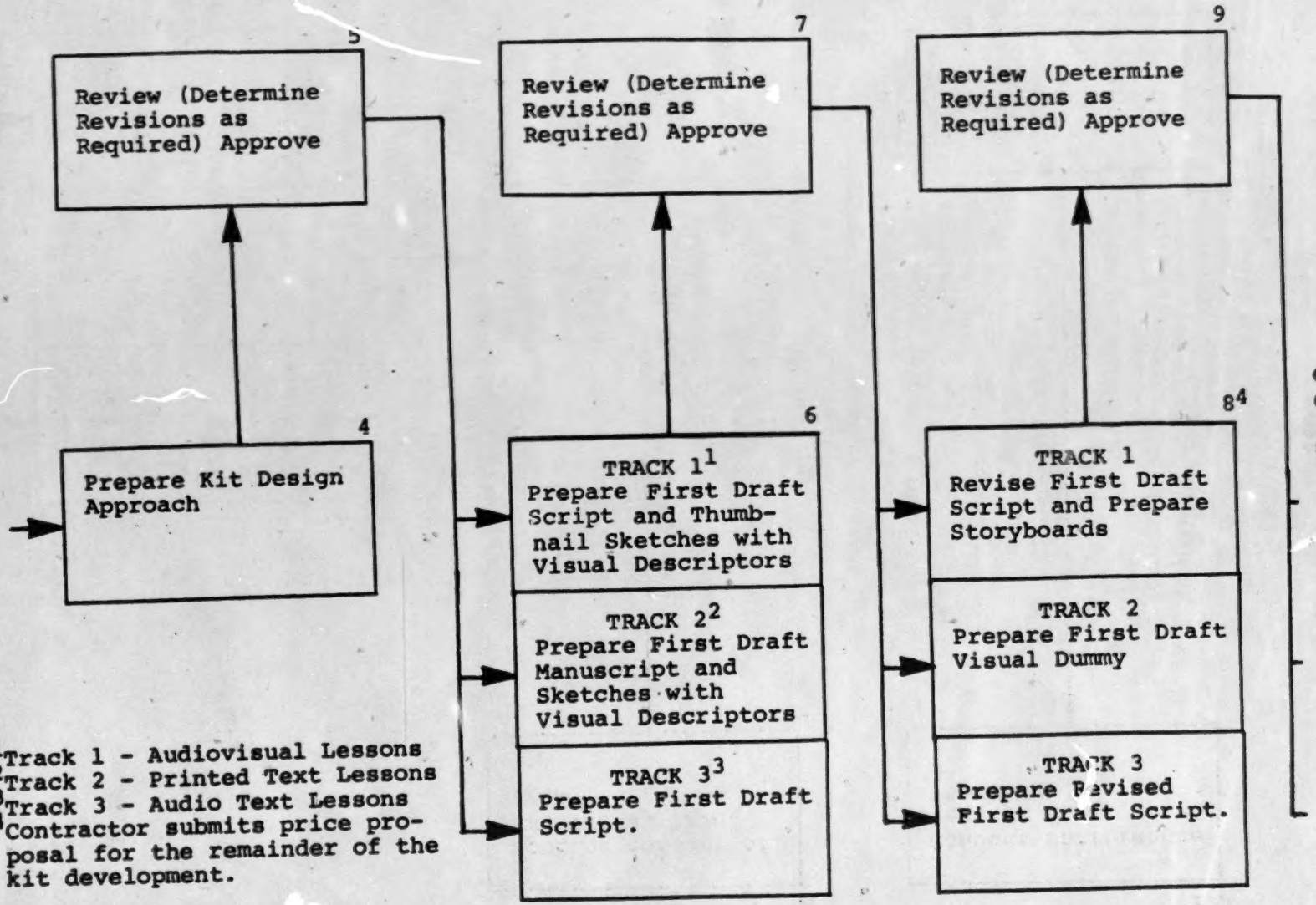
THE CONTRACTUAL LESSON

DEVELOPMENT FLOWCHART

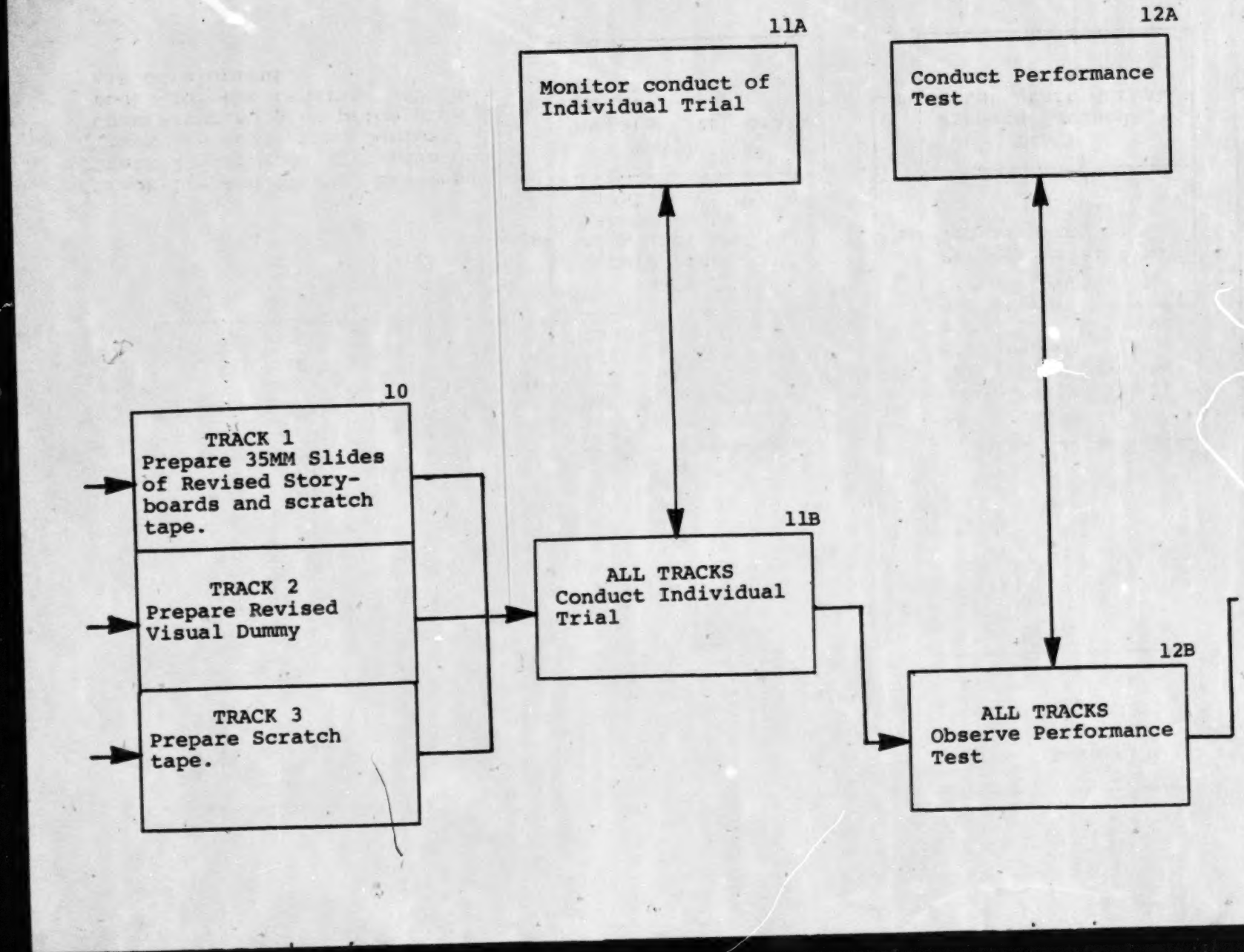
FOR TEC - ADOPTED

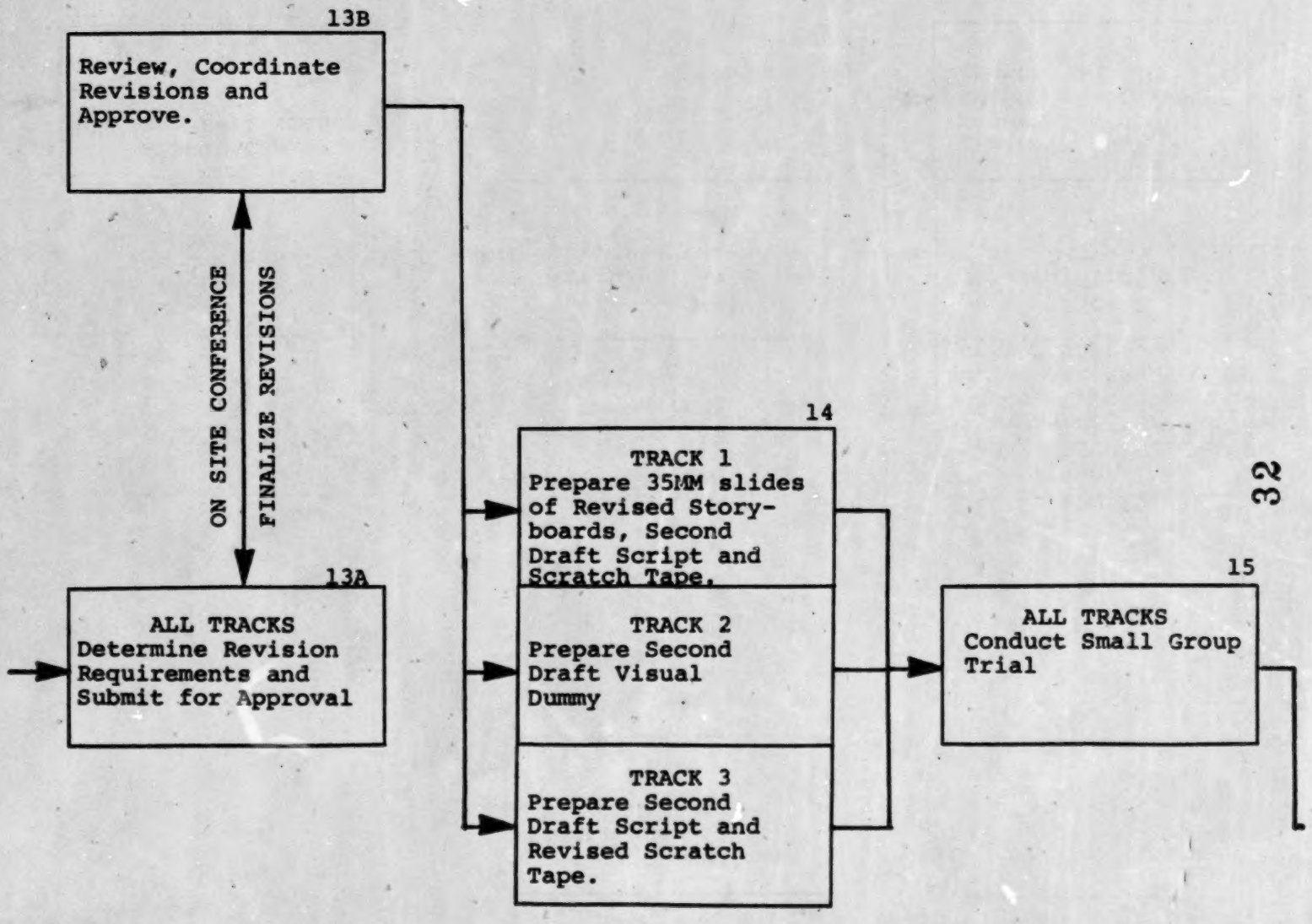
DURING PHASE II OF TEC IV

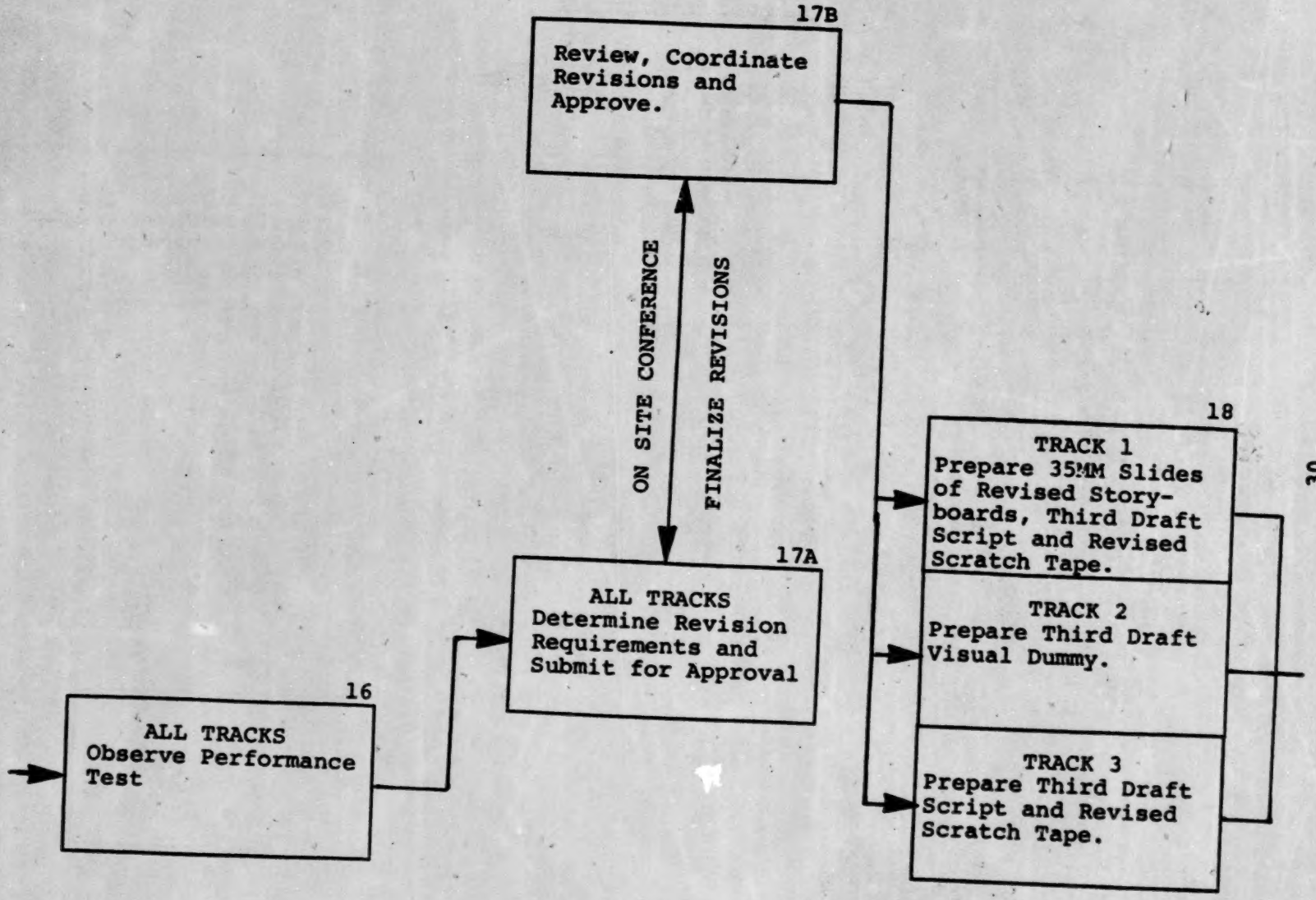
TRAINING EXTENSION COURSE (TEC)
LESSON DEVELOPMENT FLOWCHART

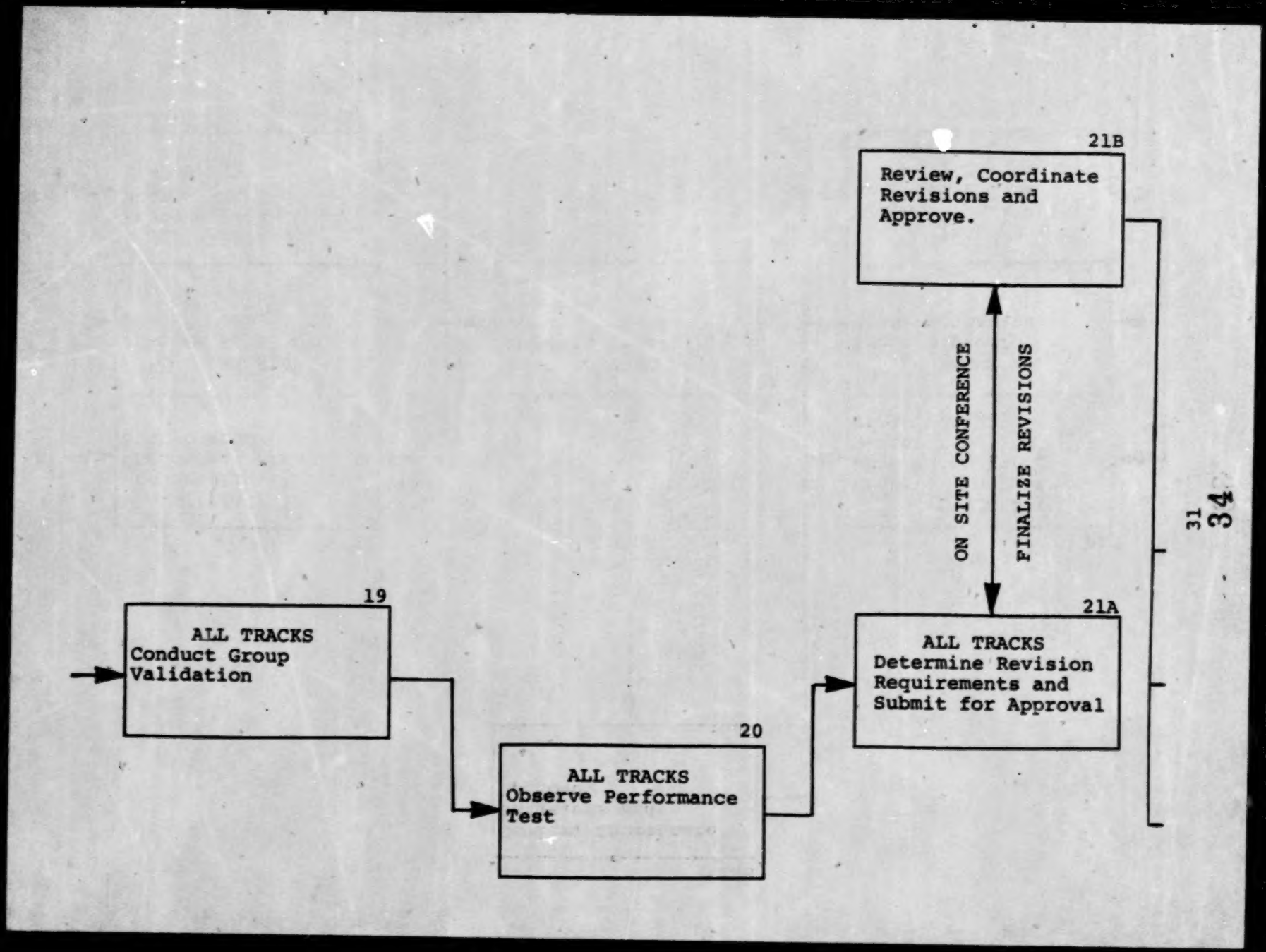

5
Review (Determine Revisions as Required) Approve
7
Review (Determine Revisions as Required) Approve
9
Review (Determine Revisions as Required) Approve
4
Prepare Kit Design Approach
6
TRACK 1[1] Prepare First Draft Script and Thumb-nail Sketches with Visual Descriptors
TRACK 2[2] Prepare First Draft Manuscript and Sketches with Visual Descriptors
TRACK 3[3] Prepare First Draft Script.
8[4]
TRACK 1 Revise First Draft Script and Prepare Storyboards
TRACK 2 Prepare First Draft Visual Dummy
TRACK 3 Prepare Revised First Draft Script.

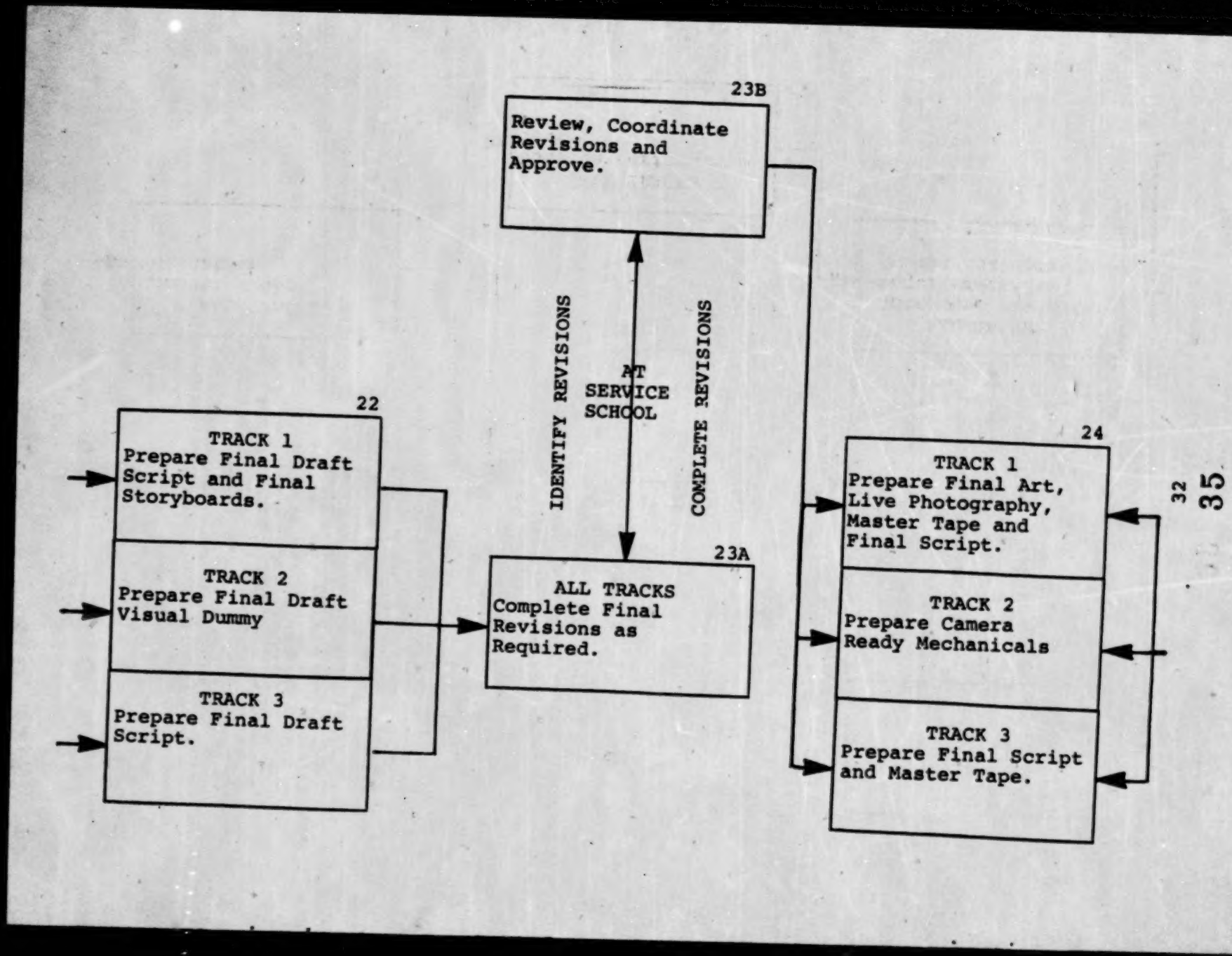
[1]Track 1 - Audiovisual Lessons
[2]Track 2 - Printed Text Lessons
[3]Track 3 - Audio Text Lessons
[4]Contractor submits price proposal for the remainder of the kit development.

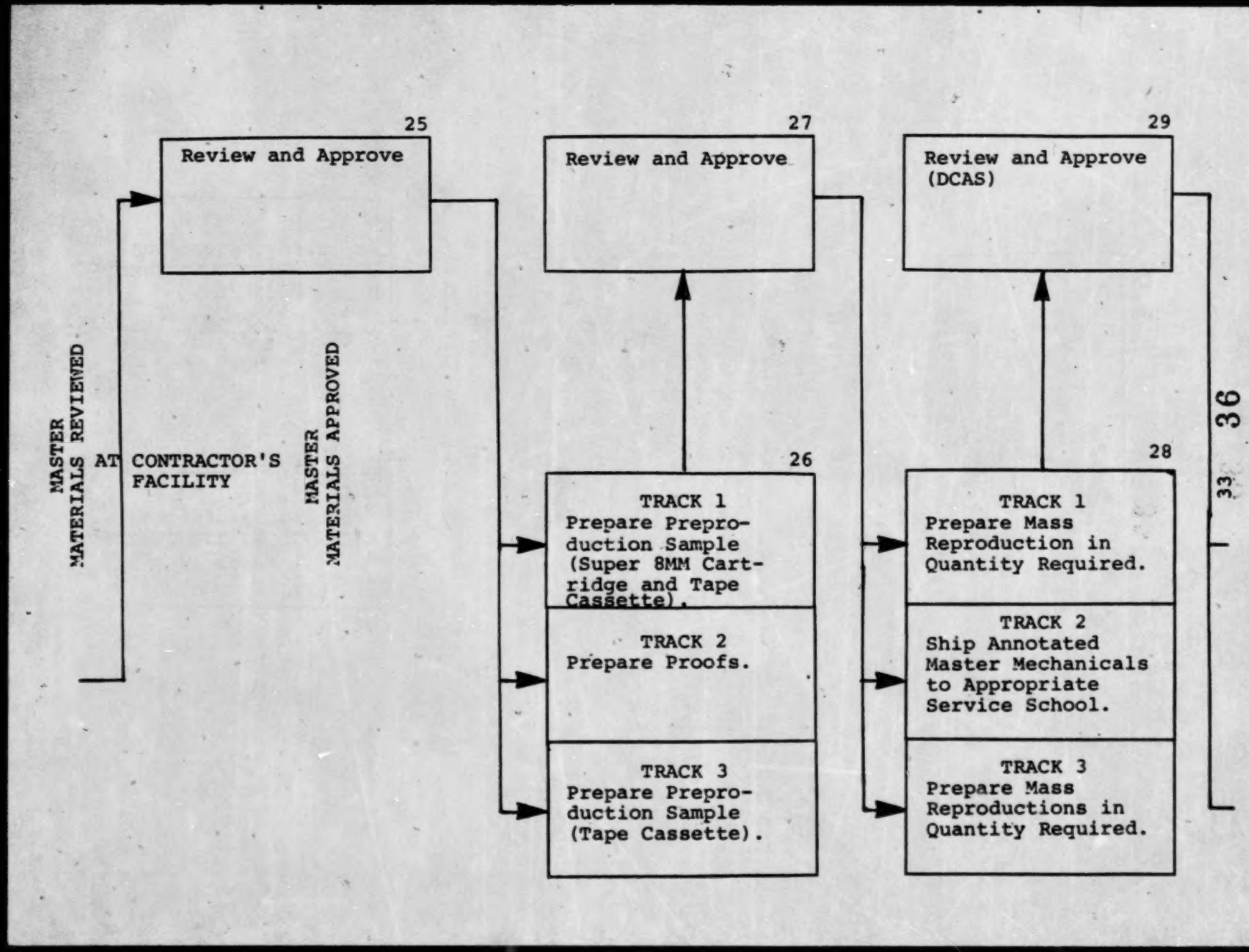

11A
Monitor conduct of Individual Trial
12A
Conduct Performance Test
10
TRACK 1
Prepare 35MM Slides of Revised Story-boards and scratch tape.
TRACK 2
Prepare Revised Visual Dummy
TRACK 3
Prepare Scratch tape.
11B
ALL TRACKS
Conduct Individual Trial
12B
ALL TRACKS
Observe Performance Test

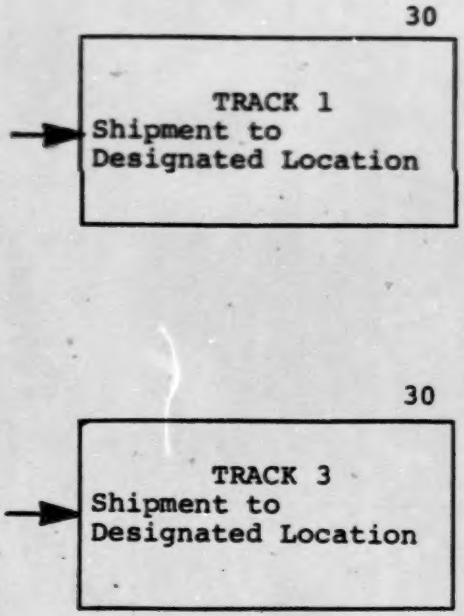

13B
Review, Coordinate Revisions and Approve.
ON SITE CONFERENCE
FINALIZE REVISIONS
13A
ALL TRACKS
Determine Revision Requirements and Submit for Approval
14
TRACK 1
Prepare 35MM slides of Revised Story-boards, Second Draft Script and Scratch Tape.
TRACK 2
Prepare Second Draft Visual Dummy
TRACK 3
Prepare Second Draft Script and Revised Scratch Tape.
15
ALL TRACKS
Conduct Small Group Trial


17B
Review, Coordinate Revisions and Approve.
ON SITE CONFERENCE
FINALIZE REVISIONS
17A
ALL TRACKS
Determine Revision Requirements and Submit for Approval
16
ALL TRACKS
Observe Performance Test
18
TRACK 1
Prepare 35MM Slides of Revised Story-boards, Third Draft Script and Revised Scratch Tape.
TRACK 2
Prepare Third Draft Visual Dummy.
TRACK 3
Prepare Third Draft Script and Revised Scratch Tape.


21B
Review, Coordinate Revisions and Approve.
ON SITE CONFERENCE
FINALIZE REVISIONS
31
34
19
ALL TRACKS
Conduct Group Validation
21A
ALL TRACKS
Determine Revision Requirements and Submit for Approval
20
ALL TRACKS
Observe Performance Test


23B
Review, Coordinate Revisions and Approve.
IDENTIFY REVISIONS
AT SERVICE SCHOOL
COMPLETE REVISIONS
22
TRACK 1
Prepare Final Draft Script and Final Storyboards.
TRACK 2
Prepare Final Draft Visual Dummy
TRACK 3
Prepare Final Draft Script.
23A
ALL TRACKS
Complete Final Revisions as Required.
24
TRACK 1
Prepare Final Art, Live Photography, Master Tape and Final Script.
TRACK 2
Prepare Camera Ready Mechanicals
TRACK 3
Prepare Final Script and Master Tape.
32
35


25
Review and Approve
27
Review and Approve
29
Review and Approve
(DCAS)
MASTER
MATERIALS REVIEWED
AT CONTRACTOR'S
FACILITY
MASTER
MATERIALS APPROVED
26
TRACK 1
Prepare Preproduction Sample (Super 8MM Cartridge and Tape Cassette).
TRACK 2
Prepare Proofs.
TRACK 3
Prepare Preproduction Sample (Tape Cassette).
28
TRACK 1
Prepare Mass Reproduction in Quantity Required.
TRACK 2
Ship Annotated Master Mechanicals to Appropriate Service School.
TRACK 3
Prepare Mass Reproductions in Quantity Required.
33
36


30
TRACK 1
Shipment to
Designated Location
30
TRACK 3
Shipment to
Designated Location

37

34

EXPLANATION OF FLOW DIAGRAM

EVENT 1. DELIVERY OF GOVERNMENT FURNISHED MATERIALS (GFM). The Government provides the Contractor with GFM for each lesson. At a minimum, the GFM consists of a Coordination and Contract Summary Sheet (CCSS) which includes (1) a subject area title, (2) purpose and scope, (3) target audience description, (4) references and equipment, (5) names of government technical advisor and/or subject matter experts, (6) minimum task performance standard, (7) training objectives, (8) criterion-referenced test items, and (9) necessary performance tests. Additional GFM such as previous lesson plans, field manuals, television tapes, technical manuals, photos, etc. is provided based on availability and pertinence to the subject matter. The delivery of the GFM is accomplished at the appropriate US Army Service School. The Contractor reviews the GFM package at the school and resolves apparent deficiencies with Government personnel. The Contractor and Government also make considerations and plans for the conduct of subsequent events.

EVENT 2. PREPARE LESSON CONTENT ANALYSIS REPORT. Upon receipt of the GFM, the Contractor prepares a Lesson Content Analysis. During this event the Contractor identifies

any deficiencies in the GFM which may interfere with developing the Kit Design Approach in Event 4, determines the procedure to correct these GFM deficiencies and corrects the GFM deficiencies using these procedures. The Contractor uses this event to identify interrelationships and hierarchical ordering of kits which are components of the lesson. Methods used in this event to perform the lesson content analysis may include; interviews, (with selected personnel from the target audience, subject matter experts, job incumbents, supervisors, technical advisors, other personnel), observing performance of tasks at job or training sites, observing the administration of performance tests, observing on-going instruction of the training objectives and detail review of GFM. The methods used are in sufficient detail to gather the necessary information to prepare first draft materials in Event 6. The Contractor prepares a Lesson Content Analysis Report containing as a minimum:

(1) GFM deficiencies noted by the Contractor and verified by the Contracting Officer's Technical Representative (COTR);

(2) Corrective action taken on GFM deficiencies;

(3) When applicable, revised training objectives, criterion referenced test items, minimum standards, and performance tests;

(4) Identified number of kits with their interrelationships;

(5) Identified media for each kit with its rationale; and

(6) Modifications to the trial/validation procedures previously approved by the Government if required for the kits in question.

EVENT 3. GOVERNMENT REVIEW OF THE LESSON CONTENT ANALYSIS REPORT.

The Lesson Content Analysis Report is submitted to the Government for review and approval. Approval authority rests with the COTR. If, as a result of Government review, major defects are found to exist, it may be necessary for a meeting between Contractor and Government personnel to correct, revise and/or change the material prior to the Contractor proceeding to Event 4.

EVENT 4. PREPARE KIT DESIGN APROACH

The Contractor prepares a Kit Design Approach for each kit. Each Kit Design Approach contains as a minimum:

(1) Kit Description; A Kit Title, Technical Advisor/ Subject Matter Expert, Contractor's Kit Designer, and if more than one kit is being developed for a lesson, a state-

ment describing how the kit being developed relates to other kits within the lesson,

(2) Kit Strategy; A statement of how the kit is to be developed. It provides an overview of the complete kit to include what the student will be taught, prerequisites to the kit, sequencing or chaining and how each sequence or chain supports or accomplishes each training objective. It also provides the creative approach to the kit (music, humor, dramatic situation, motion, animation),

(3) Kit Outline; A brief outline of the intended kit to include headings, tape running time, student involvement time, art/photo requirements and training objectives supported by each outline heading,

(4) Administrative Requirements; A brief outline of the requirements to support the kit (soldiers, equipment, materials, etc., and the specification requirements of the target audience, etc.), and

(5) Change in Design; A provision for making and recording changes in the Kit Design Approach as it proceeds through the development process. The Contractor is required to utilize not only GFM, but also obtain information from Government Subject Matter Experts, Government Educational Specialists, and other appropriate Government personnel.

EVENT 5. GOVERNMENT REVIEW OF KIT DESIGN APPROACH

The Contractor's Kit Design Approach is submitted to the Government for review and approval. Revisions and approval returned to the Contractor by the COTR via annotated Kit Design Approach and the Government identifies and provides each kit with a lesson number. Revision clarificatioh as required by the Contractor is accomplished with the COTR. If, as a result of Government review, major defects are found to exist it may be necessary for a meeting between Contractor and Government personnel to correct, revise and/or change the material prior to the Contractor proceeding to Event 6.

NOTE: If motion sequences are required and approved, the Government provides the appropriate motion sequence not later than Event 12 or specifies that the Contractor is required to shoot motion sequences for a particular kit.

EVENT 6. PREPARE FIRST DRAFT MATERIALS

The Contractor prepares First Draft Script and thumbnail sketches with visual descriptors (Track 1) and/or prepare first draft manuscript and sketches with visual descriptors (Track 2) and/or prepare first draft script (Track 3). All drafts are prepared at a comprehension level suitable for the target audience. By comprehension level, it is meant that the target audience will be able to listen to,

view, read, and interact with the materials in such a manner as to follow instructions, understand procedures, etc. as evidenced in the developmental trials and validation. (Events 11, 15 and 19).

EVENT 7. GOVERNMENT REVIEW OF FIRST DRAFT MATERIALS

The Contractor's First Draft Materials are submitted to the Government for review and approval. Revisions and approval are returned to the Contractor by the COTR via annotated First Draft Materials. If as a result of Government review, it is found that major problems exist in the First Draft Materials, it may be necessary for a meeting between Contractor and Government personnel to correct, revise and/or change first draft content.

EVENT 8. PREPARE REVISED FIRST DRAFT AND VISUAL MATERIALS

The Contractor insures all revisions, changes and/or corrections necessary as a result of Government review at Event 7 are reflected in the Revised First Draft Materials. Semi-comprehensive storyboards (Track 1) Visual Dummy (Track 2) and the revised first draft script (Track 3) are prepared in this event by the Contractor. During preparation of these materials the Contractor prepares a pretest and a posttest to be used in the conduct of Events 11, 15 and 19. The pretest and posttest are submitted with the Revised First Draft Materials for review and approval.

EVENT 9. GOVERNMENT REVIEW OF REVISED FIRST DRAFT AND VISUAL MATERIALS.

The Contractor's Revised First Draft Materials, visual materials, pretest and posttest are submitted to the Government for review and approval. Revisions and approval are returned to the Contractor by the COTR via annotated materials submitted, or attached notes, references, etc. Revision clarification as required by the Contractor is accomplished by contact with the COTR. If as a result of Government review, it is found that major defects exist in Visual Materials submitted with Revised First Draft Materials it may be necessary for a meeting between Contractor and Government personnel to correct, revise and/or change submitted materials.

EVENT 10. PREPARE MATERIALS FOR INDIVIDUAL TRIAL

The Contractor insures that all revisions, changes and/or corrections necessary as a result of Government review Event 9 are reflected in the materials required to conduct the Individual Trial. These materials may include, at the option of the Government, 35 mm slides of storyboards and a scratch tape of script (Track 1), revised visual dummy (Track 2), and/or a scratch tape (Track 3). At the

beginning of this event, the Contractor informs the COTR of the requirements for the conduct of Event 11.

EVENT 11 A & B. CONDUCT INDIVIDUAL TRIAL

The Contractor conducts the Individual Trial at a time and site agreed to by the Government. The Government monitors the conduct of the trial and verifies that approved procedures were followed. The location may be at the school responsible for the instruction or at another site when, for the purposes of obtaining valid test results, a more suitable target population is available. This trial is conducted with 3 to 5 students. Testing instructional materials on 3 to 5 students (individually) representing the target audience constitutes 1 trial. The Government provides physical facilities for the conduct of the trial, to include 35mm projectors, tape cassette players and any military equipment for performance testing. The Contractor provides storyboards, 35mm slides in carousel trays, scripts and scratch tape (Track 1), visual dummy (Track 2), script and scratch tape (Track 3) as prepared in Event 10. The Contractor also provides any materials necessary for the proper certification of the trial, i.e., answer sheets, note pads, response arrays, etc., as required. The Contractor is responsible for its own administrative support during the trial.

EVENT 12 A & B. CONDUCT AND OBSERVE PERFORMANCE TEST

The Government conducts the Performance Test which certifies that the student can in fact perform tasks learned from the instructional materials. This is necessary when the use of the actual equipment with the lesson is inappropriate because of size or the availability of equipment for training purposes is extremely limited. The Contractor participates as an observer during the conduct of the performance test for the purpose of identifying necessary kit revisions.

EVENT 13 A&B. DETERMINE REVISION REQUIREMENTS

Revision requirements are identified by the Contractor during the conduct of the trial in Event 11 and while observing the performance test in Event 12. Revisions are specified by the Contractor by annotation of the Revised First Draft Materials and by separate document keyed to the the script, storyboards, visual dummy, etc. The Contractor's trial personnel remain at the trial site until an agreement is reached by the Government and the Contractor on the specific requirement for revisions, changes and/or corrections to the instructional material following completion of the developmental trial and performance test. Determination is made by the Government at this event whether to use the

Small Group Trial (Event 15) or go directly to Group Validation (Event 19). The Government makes the decision at this event whether comprehensive storyboards or final art will be used for visuals.

EVENT 14. REVISE MATERIALS FOR SMALL GROUP TRIAL OR GROUP VALIDATION

The Contractor incorporates the approved revision requirements as determined in Events 13A and 13B and prepares the following:

Track 1 - Revised Storyboards and Second Draft Script, (at the option of the Government) 35mm slides of storyboards and scratch tape; or

Track 2 - Second Draft Visual Dummy, or

Track 3 - Second Draft Script, and at the option of the Government a scratch tape.

At the beginning of this event the Contractor informs the COTR of the requirements for the conduct of Event 15 or Event 19.

EVENTS 15, 16, 17A, 17B, 18. CONDUCT SMALL GROUP TRIAL

The decision as to whether or not Events 15 through 18 are to be used is made by the Government during Events 13A and

B. The conduct of Events 15 through 18 are similar to Events 11 through 14 except that 6 to 8 students participate in the Small Group Trial. During the conduct of Events 15, 16, and 17A and B, Government participation is the same as it was for Events 11, 12, and 13A, B. The Contractor has the same performance parameters and responsibilities in conducting the Small Group Trial as in the Individual Trial.

EVENT 19. CONDUCT GROUP VALIDATION

The Group validations (all tracks) are conducted by the Contractor with 10 to 30 students. The actual number of students is determined by the Government. The Government monitors the conduct of the Group Validation and verifies that approved procedures were followed. The Government and Contractor's responsibilities for the conduct of this event are the same as those specified in Event 11.

EVENT 20. OBSERVE PERFORMANCE TEST

For explanation see Event 12.

EVENT 21A & B. DETERMINE REVISION REQUIREMENTS

The Contractor, after completion of Events 19 and 20, finalizes all revision requirements. Revisions are speci-

fied by the Contractor by annotation of the Revised Draft Materials and by separate documents keyed to the script, storyboards, visual dummy etc. Since it is possible that instructional revision may be required, the Contractor's personnel remain at the trial site until an agreement can be reached by the Contractor and the Government on the specific requirements for revisions, changes and/or corrections to the instructional material following completion of the validation and performance testing.

EVENT 22. PREPARE FINAL DRAFT MATERIALS

The Contractor, following Event 21A and B, incorporates all finalized, approved revision requirements into the instructional materials for submission to the Government as a Final Draft Script and Storyboards (Track 1) or a Final Draft Visual Dummy (Track 2) or a Final Draft Script and Scratch Tape (Track 3). During the accomplishment of this event the Contractor coordinates with the COTR the date and time for the conduct of the next event.

EVENTS 23A & B. CONTRACTOR AND GOVERNMENT FINAL DRAFT REVIEW

The Contractor and Government personnel attend a final

draft review with appropriate personnel present at the school responsible for the instruction. This meeting is to review materials and insure all final draft instructional materials are correct. This meeting results in directions explicit enough to preclude any misinterpretation or error from occuring in the production of the Master Materials (master tapes, final art, and camera-ready mechanicals). This review meeting represents a final date when all instructional materials are reviewed and finalized. At this event the Government provides the information for the kit labels and Student Instruction Sheet (SIS).

EVENT 24. PREPARE MASTER TRAINING KIT MATERIALS

The Contractor using all approved Final Draft Materials provides Master Training Kit Materials to include as a minimum:

Track 1 - Master art/photography, master narrated magnetic tape (pulsed), final script, shooting script; or

Track 2 - Master camera-ready mechanicals (includes printed text and/or test sheets, answer sheets, etc., as required), master art or retouched photos if not on mechanicals; or

Track 3 - Master narrated magnetic tape
Final Script.

During the conduct of this event the Contractor and the COTR select a date for the review and approval which takes place at the Contractor's facility (Event 25).

EVENT 25. INSPECTION OF MASTER TRAINING KITS

At the Contractor's facility, the Project Engineer from the Naval Training and Equipment Center inspects Master Training Kits for quality, specification compliance, and compliance with approved Final Draft Materials. Following inspection, the Project Engineer accepts or rejects the Master Training Kits.

EVENT 26. PREPARE PREPRODUCTION SAMPLES

The Contractor prepares (from the accepted Master Training Kits) a Super 8mm color corrected film loaded in a Technicolor Silent Super 8mm Magi cartridge and a copy of the pulsed master tape in an appropriate tape cassette (Track 1), and/or proof prints of master mechanicals (Track 2), and/or a duplicate of the master tape in an appropriate tape cassette (Track 3). Following preparation of these materials the Contractor prepares 4 copies of Track 1 and 3 along with the final approved script, and 3 copies of Track 2 to be delivered to appropriate facilities designated by the

Contracting Officer or a duly authorized representative. The Contractor has 8 working days to accomplish Event 26.

EVENT 27. GOVERNMENT INSPECTION OF PREPRODUCTION SAMPLES Upon receipt of the preproduction samples, prepared in the previous event, the appropriate school reviews them and sends their comments to the Project Engineer at the Naval Training Equipment Center (NTEC) Orlando, Florida. The Project Engineer inspects the preproduction samples for compliance with applicable specifications and quality provisions of the contract. Upon completion of inspection the Project Engineer notifies the Contractor through the COTR of acceptance or rejection and, if any, corrective action to be taken. This is followed by a document to the Contractor for record purposes. If correction is necessary, the Contractor takes corrective action as directed and resubmits the necessary items. (NTEC retains original samples for comparison to resubmitted items when received). The Contractor has 8 working days to resubmit the corrected samples. If no further corrective action or submissions are necessary and the materials are approved, the Project Engineer informs the Contractor through the COTR of this approval and initiates an Engineering Acceptance Report (EAR) which is forwarded to the Contractor to verify approval. For all tracks, the EAR

sets forth a date of approval, shipment required, and destination. For Tracks 1 and 3 the EAR also specifies the quantities of kits required in mass reproduction. The Project Engineer labels the approved preproduction samples (Tracks 1 and/or Track 3) and returns them with the EAR. These samples are used by the Defense Contracts Administration Services (DCAS) Inspector during the conduct of Event 29.

EVENT 28. MASS REPRODUCTION

The Contractor, upon receipt of the approval in the previous event, packages and ships Track 2 Master Training Kits to the appropriate U. S. Army Service School. The Contractor includes printing instructions and annotated master mechanicals to facilitate and insure that printing production can be without error. The packaging and shipping of these kits is in consonance with applicable specifications. The Contractor, upon receipt of the approval in the previous event, begins mass reproduction of Track 1 and 3 Master Training Kits. The Contractor has 20 working days to reproduce and deliver the required number of copies. Approximately 10 days prior to completion of the mass reproduction run the Contractor arranges with DCAS a date on which to conduct the inspection (Event 29).

If a delay of 5 working days or more is forecast for the inspection, the Contractor informs the COTR of the delay.

EVENT 29. DCAS INSPECTION OF MASS REPRODUCTION ITEMS

The Government performs an inspection of mass reproduction kits. Using the approved preproduction samples, applicable specifications, including packaging and shipping. The DCAS Inspector also insures mislabeling has not occured. If the Inspector finds that the kits do not comply with contract specifications there is corrective action taken by the Contractor to insure that all kits comply with the approved preproduction samples, specifications, etc. The Contractor initiates corrective action and supplies the reproduction copies within 20 working days. Requirements fof re-inspection of corrected kits is coordinated with the DCAS office and inspection accomplished on all kits as outlined above.

EVENT 30. SHIPMENT OF MASS PRODUCTION ITEMS

Following acceptance in Event 29, the Contractor packages and ships the mass reproduction kits to the designated facility, utilizing government (US Army) Indicia labels or Government Bills of Lading (GBL) as obtained from the local DCAS Transportation Office. The Mode of shipment is stipulated by the Contracting Officer or a duly authorized representative.